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ABSTRACT

This study investigates the performance of students in a simulation correlated with selected measures of their personality, attitudes toward children and teaching, creativity, and effective reasoning in an attempt to discover variables which identify good and poor solvers of teaching problems. Thirty-six elementary education majors were administered the Myers-Briggs Personality Type Indicator, the Minnesota Teacher Attitude Inventory, the Verbal Test (Form A) of the Torrance Tests of Creative Thinking, and the Watson-Glaser Critical Thinking Appraisal tests prior to participation in the simulation. Subjects were provided simulated professional materials and an orientation describing the city, the city school district, and the elementary school and its program. Next, each subject was asked to write responses to eight simulated critical teaching problems, which were rated on a scale ranging from high to low by 25 teachers. An overall score was computed for each subject on each of the eight problems and a correlation matrix was set up using scores from the eight problems and nine predictor variables. The results suggest notation of the distinction between statistical significance and the magnitude and importance of the relations among variables. It is recommended that more data be collected before making a final judgment. (A table of results and a list of nine references are included.) (PD)

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"A STUDY OF POTENTIAL CORRELATES OF PROBLEM SOLVING BEHAVIOR IN A FIFTH GRADE SIMULATION"

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Recommendations from teacher educators for the application of simulation techniques and materials to aid in the preparation of teachers have increased markedly in recent years. The designers of ten prominent elementary teacher education models advocated "heavy use of simulation -- situations which are somewhat less complex than the "real world of the teacher" to teach clinical skills."[1] Some factors contributing to the increased interest in the application of simulation to teacher education include (1) a general disappointment with the shortcomings of the student teaching experience, (2) a growing recognition that theory can be taught best when it is juxtaposed with reality, and (3) the increased feasibility of presenting relevant features of the classroom to prospective teachers in a college campus setting.[2] It is notable that a chapter on gaming and simulation has been included in the Second Handbook of Research on Teaching.[3]

Unfortunately, there is little research attesting the application of simulation to teacher education. Some extant research indicates classroom simulator experience for preservice teachers equips them with a problem solving technique;[4] and, that this experience is sometimes successful and sometimes unsuccessful[5,6,7] in producing transfer to classroom practice. To date, researchers have focused on the effects of a classroom simulator on teacher behavior. This study; however, examined a more fundamental aspect of simulation.

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The purpose of the study was to investigate if performance of Ss in a simulation correlated with selected measures of their personality, attitudes toward children and teaching, creativity, and effective reasoning.

This investigation of potential correlates was an attempt to discover variables which identify good and poor solvers of teaching problems. Such research, if successful, could lead to the development of alternative, perhaps superior, methods for the selection of teacher candidates than those presently available to teacher educators, as well as support greater application of the technology.

SUBJECTS:

Thirty-six students majoring in elementary education participated in the study. None had previous teaching experience in elementary school classrooms and all Ss were juniors at the entering phase of professional coursework.

PROCEDURES:

Prior to participation in the simulation, the following instruments were administered to the Ss: (1) Myers-Briggs Personality Type Indicator (MBPTI), (2) Minnesota Teacher Attitude Inventory (MTAI), (3) Verbal Test (Form A) of the Torrance Tests of Creative Thinking, and (4) Watson-Glaser Critical Thinking Appraisal. These four instruments purportedly measure features of personality, attitudes toward children and teaching, creativity, and effective reasoning, respectively.

As the Ss engaged in the Teaching Problems Laboratory (TPL) simulation,[8] each S assumed the role of Pat Taylor, a fifth grade teacher in a simulated city-school setting. To orient the Ss to the simulated setting, two filmstrips and accompanying recordings provided descriptions of the city, the city school district, and the elementary school and its program. In addition, each S was furnished simulated professional materials normally available to a classroom

teacher, such as (1) a curriculum handbook and audiovisual catalog, (2) a faculty handbook, (3) cumulative record folders, (4) a reading progress report, and (5) sociograms. The Ss reviewed these materials and information related to the children. Each S subsequently encountered, studied, and provided written reactions to eight simulated critical teaching problems. The latter problems were chosen from a list of thirty-one reported most frequently by 163 elementary teachers.* The following critical teaching problems were selected to serve as criterion variables (c.v.) in the study:**

Critical Teaching Problem		Method of Presentation
c.v. 1:	Handling the constantly disruptive child	Film
c.v. 2:	Getting students to do homework	Written
c.v. 3:	Handling children's aggressive behavior toward one another	Film
c.v. 4:	Differentiating instruction for slow, average, and gifted children in the class	Written
c.v. 5:	Motivating students to work on class assignments	Film
c.v. 6:	Not knowing what to do with students who finish work early	Film
c.v 7:	Having students see relationships between undesirable behavior and its consequences	Written
c.v. 8:	Involving many of the children in group discussions.	Film

In each of four simulation sessions, all Ss furnished written reactions to ordered stimulus questions and statements as each independently worked

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*These eight simulated teaching problems were designated by Donald R. Cruickshank, author of the TPL, as problems which have elicited significant responses from former participants in the simulation.

**These problem statements were not disclosed to the Ss since the initial question posited to each S was "Identify the problem."

through the same critical teaching problem. All Ss worked through a specific problem solving process. The process included (1) problem identification; (2) identification of factors contributing to the problem; (3) determination of available courses of action; and (4) selection and implementation of the most desirable alternative.

No communication among Ss was permitted--a precaution established to insure the independence of participant responses. Response sheets were collected after all Ss completed a problem. No subsequent discussion of any of the eight problems was conducted until the final simulation exercise was completed during the third week of meetings.

As indicated above, four instruments were administered to the Ss prior to their engaging in the simulation. These specific instruments were selected, a priori, because they measured qualities which were related to and/or elicited by the above problem solving process employed in the simulation.[9]

A scaling procedure was then established for assigning weights to the subjects' responses. Unique responses to questions for each teaching problem were transcribed on rating sheets in a random order. The following is an illustration of the rating scale for responses to Problem #5, Question #1:

Question #1: Identify the problem.

A. Several students are disruptive.
High_____ _____ _____ _____ _____Low

B. None of the children wants to do the assignment.
High_____ _____ _____ _____ _____Low

Gradations of response from High to Low included very high, moderately high, neutral, moderately low, and very low, respectively. Raters of the responses were twenty-five experienced teachers with an average of four years teaching experience. The range of experience was thirteen years.

Prior to rating the responses, all raters (1) received an orientation to

the simulation, (2) studied the background materials and children's records, and (3) were introduced to the problem via a film or writtem medium. Raters did not discuss the problems and responses until all rating forms were collected--to insure the independence of ratings.

To develop a scale of weights from these ratings, a 27 by 27 inter-rater correlation matrix was generated for each of the eight problems. Response ratings from raters whose average correlation with all other raters was substandard for a particular problem were deleted. For example, the range of inter-rater correlations for raters considering problem number eight above was .45 .54. Four raters with an average coefficient below .45 were excluded. Ratings from the acceptable raters were averaged to arrive at an assigned scalor value for each unique response. These scalor values were then assigned to the appropriate responses provided by the Ss on the original problem solving response forms. The final step in this procedure was the computation of an overall score for each subject on each of the eight problems.

Measure of the predictor variables included scores from the MTAI, the Watson-Glasser Critical Thinking Test; subscores for Fluency, Flexibility, and Originality from the Torrance Test; and Myers-Briggs Personality Type Indicator subscores along the four continua: Extroversion-Introversion Sensing-Intuition, Thinking-Feeling, and Judgement-Perception.

The initial stage of analysis involved the generation of a 17 X 17 correlation matrix using scores from the eight problems and nine predictor variables. A step-wise multiple regression analysis was then conducted employing the eight criterion and nine predictor variables.

Results and Discussion:

A summary of the stepwise (added to) multiple regression analysis of the data is reported in Table 1. As indicated, R^2, which expresses the amount of variance in a criterion variable accounted for by two or more independent variables, achieved significance in five problems and failed to achieve significance in three problems. In problems No. 1, No. 4, and No. 5, no significant multiple R emerged.

Extroversion scores on the Myers-Briggs and scores on the Watson-Glaser accounted for approximately 11 percent and 13 percent, respectively, of the total variance of the subject's scores on criterion variable No. 2, "Getting students to do homework." Together these two variables, in linear combination, account for approximately 24 percent of the total variance. Examination of the R^2 value (.289) discloses a value greater than the sum of the two predictor variable values. R^2 continued to attain significance with addition of two more predictors. However, the contribution of these two additional variables was quite insignificant.

Analysis of criterion variable No. 7 disclosed a situation where R^2 (.449) continued to achieve a significant value in linear combination with all nine predictors. As the table discloses, only three predictors contributed significant increments to R^2. Thus, the addition of any one or all of the remaining six variables did not enhance the prediction.

In summary, Table 1. strongly suggests notation of the distinction between statistical significance and the magnitude and importance of the relations among variables. Although the F ratios for five of the problems denote significance, the magnitudes of the relations are rather trivial.

It is suggested that judgement be suspended temporarily and the collection of more data continue. Inasmuch as this is a pilot venture, some

Table 1. Multiple Regression Analysis: R^2 and Highest Predictors of the Criterion Variables (TPL Problems)

Criterion Variables:		Highest	Variables[a]	R^2
C.V. #1.	Handling the constantly disruptive child	MB-F (.088)	TT-O (.081)	.169
C.V. #2.	Getting students to do homework	MB-E (.109)*	W-G (.129)	.289*[b]
C.V. #3.	Handling children's aggressive behavior toward one another	W-G (.169)*	MB-P (.048)	.226*[b]
C.V. #4.	Differentiating instruction for slow, average, and gifted children in the class	MB-N (.050)	MB-F (.060)	.141
C.V. #5.	Motivating students to work on class assignments	MB-E (.067)	W-G (.075)	.142
C.V. #6.	Not knowing what to do with students who finish work early	MB-E (.229)*	MTAI (.030)	.288*[b]
C.V. #7.	Having students see relation between undesirable behavior and its consequences	W-G (.102)	MB-N (.126)* MB-P (.067)*	.440*[b]
C.V. #8.	Involving many of the children in group discussions.	TT-F (.114)*	MB-P (.080)	.256*[b]

* $p < .05$, Analysis of variance

a Predictors are presented in the order of analysis (left-to-right); ( ) encloses increments in R^2 for individual predictor variables.

b Cases where R^2 was significant, but some individual increments contributing to R^2 did not achieve significance.

weaknesses are recognizable in the study. The biggest problem has been one of scaling. Inter-rater coefficients which failed to achieve .75 or more weaken the validity of the criterion measures. It is questionable whether agreement can attain this level when a jury of teachers evaluates teaching problem episodes.

Sub-scores from the Myers-Briggs Personality Type Indicator, as indicated in the table, appeared frequently as first or second ranked predictors. Further investigation of the potential of this instrument appears warranted in conjunction with simulated and classroom performance.

Thus, research into predictors of teacher problem solving behavior should continue. It is time consuming, expensive and unmanageable to place teacher candidates in schools, observe them, train raters, analyze data and make screening (selection) decisions. The popular screening procedures today have little or no validity in relation to classroom performance. Simulation may yet prove to be an efficacious and less costly instrument for screening and use in selected phases of teacher education.

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9. The MBPTI purportedly furnishes a measure of personality. It was designed to implement Jung's theory of personality type. The MBPTI reports a subject's basic preferences regarding the paired types: extroversion or introversion (E or I), sensing or intuition (S or N), thinking or feeling (T or F), and judgement or perception (J or P). The MBPTI was employed in the study to ascertain if measures of performance in the simulated problems were correlated with measures of personality type.

   According to the authors of the Minnesota Teacher Attitude Inventory (MTAI), this instrument measures attitudes of a teacher and purportedly predicts how well the teacher will get along with pupils in interpersonal relationships. The interest in an attitudinal correlate of effective problem solving prompted its inclusion in this study. That is, the MTAI was employed to determine if a subject's attitude toward children and teaching would correlate significantly with measures of the quality of interaction with a simulated classroom of children.

   Scores of verbal (1) fluency, (2) flexibility, and (3) originality were derived from the Verbal Test (Form A) of the Torrance Tests of Creative Thinking. Among the prominent test activities included in this instrument are: listing possible causes of an action, listing consequences of actions, and asking questions which provide additional information about

a given situation. Participants in the TPL simulation advanced through stages of a problem solving process, a process containing parallels to activity stages existing in the Torrance Tests. For example, stage (2) in that process is similar to the Torrance Test activity, 'listing causes;' stage (4) in the problem solving process requires each S to weigh the 'consequences of his action' (Torrance Test) prior to selection of the best alternative; and another stage engages S in obtaining pertinent information, an activity similar to 'asking questions which provide additional information about a given situation,' from the Torrance Test.

The Watson-Glaser Critical Thinking Appraisal, defined as a test of effective reasoning, was the fourth potential source of correlative data. Five distinct elements of effective reasoning tapped by this instrument include: inference, recognition of assumptions, deduction, interpretation, and evaluation of arguments. In varying degrees, these elements are implicit in the problem solving process Ss employ as they proceed through a TPL simulation problem.

In summary, these instruments were selected as data sources in this study for their varying degrees of inherent surface similarity with the problem solving techniques of the Teaching Problem Laboratory.